# CATS NEWSLETTER

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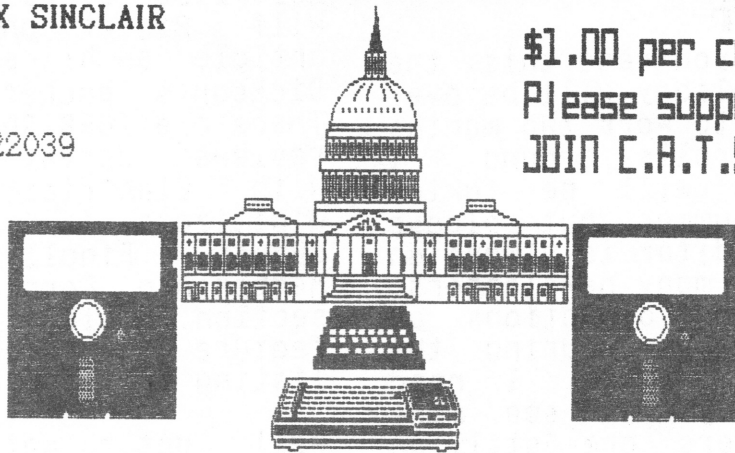
JULY, 1988

## JULY 5: THE "ASK ANNIE SHOW"

All the questions you had about interfacing, but were afraid to ask (till the last meeting)!

## IN THIS ISSUE

## CONTRIBUTORS

Bill Barnhart
Ted Osheroff
George Rey
Harvey Taylor
Fred Nachbaur

Vernon Smith
Ruth Fegley
Hank Dickson
Wilf Rigter
Warren Taylor

## PRESIDENTIAL RAMBLINGS

It is sort of strange writing on the front cover of the newsletter, but I assume I'll get used to it. This month my message will be fairly sort for two reasons. First, I've been travelling and the deadline sort of snuck up on me and, second, I want to meet with the Executive Board and read the results of the Survey.

The President's chair has, in the past, been occupied by the real "gurus" in our group. As I've said many times, I'm not one of them but I will attempt to solve your problems by pointing you in the right direction if I don't know the answer.

In the next year, many of you will be asked to volunteer your talents for various group activities and, most of all, for the planning and execution of our computerfest next Spring. I hope you will give me the support that you've given the previous presidents. Remember, this is your group and you will get out of it only what you put in.

I'm really looking forward to serving you this year.

Bill

# FROM THE EDITOR

Well, by the time you read this, the big 4th of July holiday will be over and we will have to work two months before Labor Day rolls around. I know many of you will be taking vacation this summer but please remember, "Your Editor is always on the job!" Unlike many newsletters, we do not suspend operations or print double issues during the summer. For this reason, I need your articles. As you can see, many of our usual writers are "still on vacation" but, thank goodness, others have stepped in to fill the breach.

New writers--and for that matter, the old ones, as well--should review the "Newsletter Submissions" box on this page. In order to keep up the high production standards and to help me cut down on the time it takes to prepare each issue, I need you help. If you are going to submit "hard copy", you should do the following:

   1. Make sure the copy is as dark as possible. Use a new or nearly new ribbon, since the output from 9 pin printers in the draft mode is very difficult to reproduce unless it is dark. I sometimes try to enhance light printing by running it through the Xerox, but this is not always successful. If it looks light to you, it probably is unacceptable for paste up.

   2. Please limit the column width to 3 1/2". If you are using 10 CPI (Pica), this is 35 characters; 12 CPI (Elite) column is 42 characters wide.

   3. When you mail copy, please insure that the folds do not crease the text. Use cardboard inside the envelope for stiffness and protection and, for 8 1/2" X 11" sheets, why not consider an envelope that size or a mailing tube?

If you have a QL, you can cut all this hassle by just sending me a _doc file on disk or microdrive, wrapped in foil to protect it.

I hope you enjoy this issue. TS 1000/1500 users should take note of Wilf Rigter and Fred Nachbaur's article on hi-res graphics and Hank Dickson's packet radio summary. There are 2068/Spectrum programs and reviews. Harvey Taylor's "Playing With Electricity" article on digitizers is "must" reading for QL owners. Finally, look at the Membership Corner in the Potpourri section. This will be a new monthly feature to keep your membership listing up to date.

Well, got to get this issue to bed. See you at the meeting.

*Vernon*

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## JULY MEETING AGENDA

11:00 Hardware Workshop

12:00 CYA Workshop

2:00 to 2:30 General Meeting

2:30 to 3:30 Hardware Interfacing

3:00 to 4:30 Open discussion

4:30 Adjourn

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## NEWSLETTER SUBMISSIONS

Submissions for the newsletter can be in hard copy, with columns 3 1/2 inches wide or, preferably, magnetic media. For the QL, microdrive cartridge, 5 1/4" DS/DD or Quad density disks, or 3 1/2" disks. For the ZX81, TS1000, or 2068, cassettes only, with titles on the box.

Send material to:
Editor, CATS Newsletter
Box 467
Fairfax Station, VA 22039

# LONG GRUELING ELECTION OVER

## C.A.T.S.' NEWLY ELECTED OFFICERS

The selection of officers, as published in the June '88 newsletter, were elected on a voice vote. Since there was no office in contention, all were elected simultaneously and unanimously.

The officers for the '88-'89 term:

President.......... **Bill Barnhart**

1st Vice Pres...... **Hank Dickson**

2nd Vice Pres....... **George Rey**

Secretary.......... **Mike Warnick**

Treasurer.......... **Ruth Fegley**

As our officers, incumbent and new, begin their term of office we wish them success since the coming year appears to be filled with new programs and new activities.

## Membership Corner

Current Membership Rosters (as of 5/24/88) were distributed at the June meeting. Send a large SASE for your copy. Each month we'll list changes/additions so you can keep your copy up to date.

The first change is a new address & 'phone number:

Stephan Greene
2605 Stone Mountain Ct.
Herndon, VA 22070
703/430-9495

Although this Roster contains 94 names, four are due to renew by the end of June. We still attract new members, but our record for renewals is not good. We need YOUR help in contacting those who have left our ranks. Let Bill Barnhart know of your offer of service!

# CYA WORKSHOP

A good "critical mass" of interested members met at the June meeting. The aim of the workshop is to put our computers to work on financial matters of interest to us. I proposed a primary objective to -- Identify near-term and secular economic trends by monitoring and analysing selected economic indicators. The indicators are: Interest Rates (AAA Bonds and Federal Funds), Inflation (Producer Prices), Money Supply (M2 x Velocity), and GNP. The means and interpretation of these indicators to be as per the reference "Getting in on the Ground Floor" by Stephen Leeb, 1986. For July I hope we can agree on how to format, go about, and computerize sufficient data using Abacus and/or Easel and splitting up the tasks between us.

Time permitting, we can discuss two other potential objectives -- (1) To develop investing strategies of low risk with growth, while following secular guides and trends; (2) To develop guides for the selection and screening of investment grade securities, etc.

Once we get going, I expect the workshop will provide us hands-on experience in exchanging, modifying, and processing our data via the QL Abacus and Easel programs. And, portraying the info in compatible and comparable formats. See you all July 9, from 12-2 PM.

EDITOR'S NOTE: This is an new seminar, in keeping with the group's desire to diversify its workshop offerings. For those of you unable to attend the sessions, we will attempt to keep you abreast of the proceedings.

**IF YOU HAVE SUGGESTIONS FOR OTHER WORKSHOPS, BE SURE TO FILL OUT THE SURVEY FORM IN THE BACK.**

# CATS VIEWS PACKET RADIO ON T/S 1000

BOB DIGGS (KV3Q) from North Eastern Maryland gave the June CATS meeting a first-time look at the intriguing field of data communications on the T/S 1000, using packet radio.

Hearing of CATS' continuing, unfulfilled passion for packet radio, Bob brought and set up a bundle of marvelous gear in the hardware meeting room that Saturday morning.

He connected a T/S 1000, an RS-232 interface, a Comm-Link I converter, a Terminal A connector (instead of a modem), and a handi-talkie radio transmiter/receiver.

The Comm-Link I, a black box about the size of a CD player, takes impulses from the RS-234 interface installed in the port behind the T/S 1000 and changes them into transmittable signals using ASCII code. The handi-talkie then puts the data on the air.

Before noon, Bob struck up a random conversation with an amateur radio user in Hyattsville who knew about CATS and some of its members. As time wore on, however, atmospheric conditions closed in and cut off the action for that day.

Bob's setup works with the ZX-81, T/S 1000 and 1500. The QL can also be utilized, but it's more difficult than the 1000, he says.

For the future, Bob would like to do the demonstration with a stronger transmitter. CATS would like to provide him a large-screen projector so the group could see an interactive log being created during a packet radio session.

Keep watching (and listing to) this space!!

*Please complete the survey on page 10.*

*Bring it with you to the meeting or mail it to the CATS post box.*

## Letters to the Editor

Item for CATS Meeting on Unanswered Questions:

My question is this. . .

I have:

A QL.

A Brother CE-50 daisy-wheel typewriter with a 9-pin computer port.

An interface (black box) made by Brother which accepts the 9-pin DIN plug used by the typewriter and has RS-232 parallel and serial plugs.

Given this, how do I make them all work together?

(P.S.: I can bring this monumental array of stuff to the July meeting for actual verification.)

C.H.D.

Dear Hank (Dickson),
We'll pass this along to "Dr. Quintero" and maybe he can include this in the "Ask Mannie" show at the July meeting.
The Editor

If there are any more hardware questions, let us know. We will pass them along to Mannie.

# PLAYING WITH ELECTRICITY

## by Harvey Taylor

In May/June/87 Byte magazine, Steve Ciarcia described a video digitizer project. After a good deal of hesitation, I decided to go with this system on my QL. The deciding factor in my mind was that I could use this system with any computer with a serial port. The digitizer itself is well described in those articles so I will only discuss the software I have written to drive the board.

Getting the Circuit Cellar Inc. digitizer to use with the QL meant that I had to write a software driver to control the board & display the information received. To begin at the beginning, this turns out to be another case where one runs afoul of the cheap SERial ports on the QL. Specifically, the board transmits data at the North American norm of 8 data bits, no parity, 1 stop bit.

The problem which arises is that at high speed (read 9600 baud), the QL wants at least 1 1/2 stop bits. This means that until I am able to modify the initialization sequence of the CCI board to use 2 stop bits, I must transfer data from the CCI board to the QL at a mere 2400 baud. A video field is digitized to 62464 bytes. At 2400 baud, it takes about 4 or 5 minutes to transmit the whole field. It only seems like forever.

The CCI board digitizes to 6 bits [0-63], while the QL displays at most 3 bits [0-7]. One of the first requirements then, was to define a method of Mapping the 0-63 CCI range into the QL 0-7 range. I wrote a function which takes either preset values (Linear, Square & Exponential) or User defined values and uses them as Limits to define the Mapping process. The colours which are used can be simply 0-7 or set up any way one wishes.

Once you have the information in the computer, it is useful to be able to analyze it. One of the primary methods which is used in the Image Processing world is with a special graph called a Histogram. This is a plotting of Pixel values [ 0-63 in this case ] versus number of pixels. A quick look at this graph will tell you where the values of your screen are bunched.

The fun starts when once you have the information in the computer you can begin to modify it. There are a variety of mathematical filters described in the literature. (See the bibiography below.) Among these are Low & High Pass, Laplace edge enhancement and median value filters. One might also wish to spread the Histogram out so that the full range of shades is used. This might look like a similar operation to choosing a narrow mapping, however once you have modified the data you can apply the other filters to the data in a way which only changing the mapping does not allow.

In all of these processes it is all too easy to generate garbage. One must try different techniques to see comes out. If the Black/White settings on the CCI board are set too closely together, it is difficult to do much of anything with the narrow range of values produced.

The File SpStLogo.pic contains the raw data of the Space Station Logo, a spacesuited figure in the Leonardo universal man pose. This is a 244 X 256 array of data points 0-63. There is a bit of garbage in the bottom couple lines.

Bibliography:
Steve Ciarcia - Byte Magazine, May/June/87
Image Processing - Byte Magazine Theme, March/87
Gregory Baxes - Digital Image Processing, Prentice-Hall, 1984
William Green - Digital Image Processing, Van Nostrand Reinhold, 1983

# WRx16 REVISITED!

Since our publication of Wilf Rigter's WRx16 high-res discovery (SUN Vol. 4, #2), several enterprising folks have been hard at work, developing new refinements in high-res and other "cheap video". Mr. Rigter worked up a new version of the "core," overcoming some previous hardware limitations. Gregory C. Harder, W. C. McGrath, and undoubtedly many others have made other discoveries. I worked up a couple "Interesting, maybe even useful" routines presented in this article.

But whoa! Our esteemed Editor (and probably most other folks) thinks that this is going to be yet another of Fred's incomprehensible but presumed sensible high-tech ravings. Not at all. This is a "play by doing" thing that lets you do neat things with those little TS1000's or TS1500's.

There WILL be theory sections, for your information later on, once you feel the urge to go beyond basic experimentation. The possibilities are many and varied, but there are some inevitable limitations. The theory sections will help you learn to more fully control your machine's video.

For now, though, skip these sections and just enter, enjoy, and play with the demos.

## HISTORY

To make a long story short, high resolution has always been possible on the ZX81/TS1000. It has also, somehow, always seemed out of reach, ignored, or both. Until WRx16.

In 1986, Wilf Rigter demonstrated a system of high resolution display to the Vancouver Sinclair User Group, one of the most if not THE most active ZX81 hardware group in existence. The ZX computer had just a little tack-on board, and it produced high-res screens. No internal mods were needed.

It later resulted in the commercial high-res version of SINC-ARTIST (Callisto Software) dubbed THRUST by its distributor, Weymil Corp. Because of the large number of "Hunter" board owners, the program found its way to many users, and became a classic "must-have" for this machine. It represents the entry-level of high-quality graphics development, giving you an Artist program with many features of programs for larger machines.

The rest is "history." When we ran it over a year ago, we had no idea that this would stir as much of a resurgence of interest in the ZX81. One short 79-byte program and a small memory board, and it makes this computer once again a viable tool in a world of IBMs, Ataris and others. The saga continues....

## DESCRIPTION

WRx16 is a system of high-resolution (256x192) display using simple multi-purpose hardware; a suitable non-volatile 8K static RAM, such as the one we ran in SUN 4:1. What's more, programming for it is comparatively simple. An Extended BASIC is available, and several applications have sprung up using this system. There are even programmers working with this in the U.K. It should be interesting to see what they come up with.

Here and now, there are yet more vistas in display exploration for the ZX81-family. Some will allow the creation of a windowing 128-line Editor routine, which allows instant horizontal scrolling of the 64-column window. New possibilities for modemming exist, involving the use of a 1200-baud modem for the machine. All at very low cost.

On that subject, the VSUG newsletter, ZX-Appeal, reports in the Feb-Mar '88 issue that TS1500's with TS2040 printer are available for as low as $30 from Electronic Surplus Inc. in Cleveland. This, plus a small static memory board, is a small investment for a high-res-capable learning system. You can even do "real work" with it, as communicate to BBSs and info services. In the future, you will be able to do far more.

## HARDWARE

What do we mean by "suitable static memory?" This is the only thing that might be construed as a "catch." Fortunately, you have several options.

1: Modified Hunter board. See the Theory section for the mod. It just involves soldering two small, cheap parts, and cutting one trace of the board. This popular device was sold into the thousands years back, and is still a popular commodity to haggle over with other users.

2: Built-in NVM. See SUN 4:1, for a circuit worked up by Wilf for Gerd Breuning, who developed it into a truly professional construction article. This just plugs into the 2K RAM socket on the board, with seven small wires

to connect to the circuit board. No trace-cuts are necessary, if you are concerned about that but aren't afraid to do a little "kitting."

NOTE: If you haven't already built and debugged this little project, here's some more motivation for you. We're working up a way of easily adding another 32K of static memory. By adding another chip, this same tiny board can now be a real powerhouse!

3: Tim Stoddard's 64K RAM. This was published in Time Designs Magazine and (in abbreviated form) in Computer Shopper. This is a neat modification to your ZX81/TS1000 that fills the full 64K with static memory. It requires several trace cuts and jumpers, so may not be up everyone's alley. TDM also ran Tim's article on interfacing the Larken DOS to the high-res system, which should be applicable to any RAM arrangement.

An important note: All developments to date assume static RAM in the entire 8-16K region. If you wish to use other things that use this memory, you will need a way to disable either conflicting device.

4: Commercial alternatives. I sell an update of the Hunter board, using 1-8K I.C. instead of 4-2K chips. Being more cost-effective, I can sell it for less than the price at which the Hunter board sold. However, I ask that you allow me at least several weeks for delivery, since parts availability seems to be a chronic problem.

A better bargain for many users will be Wilf Rigter's own 32K NVRAM. He also worked up a very good RAMDOS for it, allowing you to keep an entire collection of short programs (or a couple long ones) for instant availability when you power up. It is easily re-mappable, using a series of DIP switches, to result in virtually unlimited options with other hardware. You can even enable RAM in the ROM region, and modify the operating system to your heart's content. Note, the character sets cannot be modified.

## MOVING ALONG

So you have the basic picture. Why is this worth doing? Have someone at your local group demo this for you. You might just be amazed. There's already a lot of great software commercially available or in public domain. There are entire collections of

## Continued from page 6

interesting pictures available. You will step into the world of "real computing" with a small inexpensive communications device.

Yes, communications. I didn't say "computer" because that can be a scary word. [You REALLY have to be wary of people like me, who often refer to "the machine" in articles.] You can't use a computer if you cannot see what's going on, or otherwise communicate with it. WRx16 improves your vision by a factor of 16. The resolution is just as good as the TS2068, in normal display mode, except without the color. The quality of the display much better; it is clear and rock-steady on any reasonably good monitor. For people who, like me, don't have a NEED for color in a "serious" computer, its lack is actually an advantage because of the resulting simplicity.

In a future installment we'll tackle the last remaining gripe against the machine: its speed. The result will be a machine (preferably TS1500!) running almost twice as fast as before (in SLOW mode), with full software compatability. All at a cost of only a few dollars. Add a couple more bucks for a switch, and you can use either mode. There are even software-only methods, such as "Quick" mode in SWN 5:2. At this writing we are investigating even far more significant possibilities for speed (and possible resolution) increase.

## LET THE FUN BEGIN

In this first article of a possible series, we present a new WRx16 core. This overcomes several (virtually all) limitations of the original routine published in SWN 4:2. This is a GOOD THING TO DO to your existing WRx16 software, since it makes it usable with a greater range of hardware combinations. New programs should use this routine to prevent problems later.

I'll also demonstrate a couple interesting alternatives, using demos that you'll find in the listings.

The goal is to make you want to understand it all better, and before long you'll be poring over the theory section and your ROM disassembly, etc. Don't be afraid to experiment. You will then be on the fore-front of a wave of development that may yet result in a very inexpensive yet competent personal communications computer. This wave has already seen working prototypes of easy-to-use 256K bank-

switching. It promises new hardware advances in display resolution. It can be made operable at low power, making it an interesting and useful tool, midway between the lap-top and the desk-top. It combines some advantages of both, at a fraction of the cost of either.

Best of all, (I've been saving this little tidbit all this time) your machine will be virtually always be repairable. We're working on ways of building such "Super-ZXs" onto a single board, containing NO custom chips! (If you don't believe that it's possible, look at a ZX80 schematic!) So even if your Timex ULA or SCLD goes out, your machine can still live on. You can afford to devote interest, time and money into a device that can greatly enhance your personal productivity. You don't have to wonder if your computer will still work next week. Now isn't that a pleasant thought in trying times?

## WRx16 VERSION 2

The WRx16 core that we published in 4:2 works fine with the usual 16K RAMpack on a ZX81/TS1000. It also works, with two restrictions, on most 64K packs. The first is that the dynamic RAM should preferably be switchable in the 8-16K region. This restriction still exists on the new version; we can't do much about that. However, even some RAMs that can't be switched out here, will work in spite of the apparent conflict.

The other restriction is that we had to take special measures in software to ensure that a portion of the high-res system be copied in the top 16K block. This can get messy, since it will corrupt any other data you might have up there.

WRx16 Version 1 does not work at all with certain hardware combinations; e.g. the TS1500 alone (without external 16K pack), and the Memotech 32K pack alone. Both will work if a standard Timex 16K or similar pack is added.

Refer to the Theory and Listing 1 (disassembly) to understand why this is.

The new routine, refined by Wilf Rigter, took a few more bytes than the original routine. I (fn) then did a little byte-pynching to make it fit into the same space as before. It can therefore replace existing software, such as the utilities and demo given with the original article.

## ENTERING THE NEW ROUTINE

If you entered the version 1 demo, your task is much simplified. Use the loader (GOTO 9000) to enter the values of Table 2. Use START=16514, BYTES=128 just as when filling the 1 REM line in the original article. If you prefer, use Hot Z and Listing 1 instead. After saving the new version to tape in case of bugs, run the demo. It should work as before. The difference is that it will work with virtually any memory configuration. (Including 2K, incidentaly, provided the necessary 8K static RAM is present.)

If you're new to this, follow the article in 4:2, replacing Table 1 with the version presented here.

## THEORY

WRx16 V1 will not work if the 48-64K block is fully decoded. This is because it relies on the high-memory echo of the dummy display file. If this is not present, either in "echo" RAM or in real RAM (as 64K), the routine crashes. With 64K, we can physically place a copy exactly 32768 bytes higher than the "actual" dummy display file in the 16-32K region. However, with either of the 32K configurations mentioned above, the 48-64K region will be truly blank; no RAM, and no echo of the 16-32K block either.

More precisely, only the last two bytes of the DDF need exist in high memory. To understand why, let's review how the line-scanning system works. On receiving an interrupt, the main display loop is started. After taking care of housekeeping (counting lines), the program jumps to the high-memory echo of the dummy display file. When an M1 cycle (instruction fetch) occurs with A15 high (original ZX81 or A15 and A14 high (TS1500 or ZX81 with "Oliger mod"), the ULA takes over control. It uses the (previously set) I and R regiters as a pointer to the address (in low memory, i.e. bit 15 is held low) being displayed. This is what causes the hardware to read the contents of memory directly during the refresh interval provided for dynamic RAMs. This is why we have to AND REFSH* and RD* when controlling the SRAM's chip select. (On the Hunter board, for instance, cut the trace from RD* to CE*, bridge the gap with 4.7K, add diode from CE* to REFSH*, cathode towards REFSH*.)

The final result on the data lines is then fed serially to the TV. Meanwhile, the CPU gets fed NOPs (00h) instead of the true contents of the

instruction being "fetched." It therefore delays for 4 t-states, exactly the time it takes to display 8 horizontal dots. (Have you ever wondered why the clock crystal's frequency is twice the CPU clock frequency?)

This process continues until all 32 horizontal bytes have been displayed. At this point, the code of the instruction being fetched will have bit 6 high. (Commands like HALT, used in the normal display system; RET, used in quasi hi-res routines, and JP as in WRx16 V1 all have this in common.) This is a signal to the ULA that display is complete, and it returns control to the CPU. The CPU then executes the command.

The problem with JP is that during the data-fetch part of the cycle, when the address to which to jump is being obtained, the CPU will still think it is running in high memory (PC has bit 15 high). If the RAM is fully decoded, (i.e. no "echo" or duplicate of the low-memory copy) it will only find garbage there, and jump to some uncharted never-never-land.

Version 2 fixes this by using JP (IX) to return the line-scanning operation to the main program, instead of a JP to a fix address. This way, there is no data fetch after the instruction fetch, and the high-memory echo is no longer required. (Note also that JP (IX) meets the requirement of having bit 6 of the opcode set.)

To compensate for the difference in timing that results from using this approach, some of the "delay" commands had to be changed. This moves some of the entry points, and is why we are presenting the new routine in its entirety. The timing is about the only thing that could mess you up in experimenting. It is very critical, and has to reach certain key points at exactly the right T-state. So if you change anything, you have to be careful that the timing of your new code matches that of the old. You do this by trimming the dummy timing commands. These are marked in the listing as DELY, and timing loops are marked TILO. Get out your Zaks handbook or other Z80 reference, and keep track of T-states.

Finding suitable timing values with a minimum of required space, while not interfering with your program, can be quite an interesting challenge. Beware of some, like RRD, which appear to be great, compact time-consumers, but may not do what you expect (RRD and RLD operate on (HL) as well as A).

## THE AMAZING BI-PLOT

We all know, of course, that the daffy-nition of BI-PLOT is "the purchasing of a devious plan." Or any number of other bizarre things, which I'll leave you to decipher.

Ah, but let's get back to the real world. This article gives a demo of a way to do high-resolution grey-scale graphics. That's right! Though I may be stretching the definition, we'll actually see the ZX81/TS1000 display a high-res scale of three shades - black, white and grey. A quote I just invented runs, "Three shades doth verily a grey-scale maketh."

We'll once again use bizarre methods to put that remarkable ZX hardware/software combination to work, deviously planning to make it do things even that IT never thought possible. Best of all, you won't have to purchase a thing (assuming that you're with us so far on this high-res stuff).

For the sake of the demo, let's go back in time. Way back.... do you remember SWN Vol.1, Kids? This contained a lot of (sometimes embarrassing) "early Fred Nachbaur," including a "GreyPlot demo" that I also used in my CE-AMP program (now in shareware). Well, what could be better than to repeat that early demo, using this modification of WRX16?

### WHAT IT DOES

BIPLOT works much like "QUICK" mode (SWN 5/2) does, in the sense that it uses the built-in FRAMES counter (FRMS in Hot-Z-ese) to display different things in alternate fields of the TV display. Unlike QUICK, though, we have a continuous display, even though the speed is no faster than normal SLOW mode. (The good news is, we can use FAST mode to do all our plotting, then get into compute-and-display mode to view and play with the result.)

The way we do it, is to toggle between two different high-res display files. Anything plotted in both display files shows up as black (or white in inverse mode). Anything plotted in only one display file will only be displayed every other time. As a result, these points will look "grey." Anything else is in the background color (white or blk, in normal and inverse modes respectively).

In the demo, two sets of axes are drawn, one in each display file. However, different horizontal axes are printed just for demo purposes. Two different functions are plotted into each of the display files; their product is printed in both.

After the display has been created, you can view either hi-res display file, or both. You can also reverse the video at any time.

### THE DEMO

This demo displays several of WRX16's unique features:

1: Bit-mapped video file. This makes our plotting, etc. extremely compact (the whole mini-operating system takes less than 256 bytes). It's memory-mapped, allowing us to write to it from BASIC, using POKE.

2: Any or all vertical columns can be reversed. To reverse a column, change the corresponding element of the dummy display file to 128 (decimal). Our "reverse" (RVRS) routine simply toggles all 32 locations (columns) between 0 and 128 whenever it is called.

3: WRx16 is extremely adaptable. We can change the number of hi-res and low-res lines at will. We can do different things in different fields of the TV display. We can even do "QUICK" mode! (Topic for a future installment, if the interest is there.)

4: Since a full hi-res bit map of a 256*192 screen takes 6K, and we only have 8K available, we have to cut down the size of the hi-res portion to 2/3 of its full size. This gives two 4K blocks that can be used for two display files. With the high-res display files in high memory (as with Tim Stoddard's setup or with Delta), these could possibly be brought back to full size. However, this version demonstrates yet another neat trait of WRx16: you can display any combination of hi-res/low-res rows on one screen.

### ENTERING THE PROGRAM

### THE EASY WAY

One way to do this one is from the ground up. However, if you have followed the demos so far, you can save some time. Load the demo program of 4:2,

# CLASSIFIED ADS

## WANTED

Uncle John Wants You!

### HERE'S THE CHANCE TO DO SOMETHING FOR THE GROUP

John Riley, our Tape Librarian,
is trying to assemble a tape of
Astronomy programs. He needs
volunteer(s) to key in some of
the programs. Contact him direc-
tly or through the CATS P.O. box.

# EASEL FORMULAS

Some say the eighth wonder of the world is the power of compound interest. Its formula is $S=P(1+i)^n$ and represents what a sum (S) will result to if an amount (P) is invested at an interest (i) compounded over n years or periods. You can see what $1 (P) will grow to on Easel by entering the formula: $Sum=1*(1.06)^{(cell)}$ which gives the compound amount factor of $1 at six percent (.06) over the number of years (n) that you have cells (columns) on your Easel screen. Try it for a series of interest rates and make a composite printout of the figures (curves) and you will have a handy monogram chart for future reference and use.

Also, you can do likewise to get a present-worth factor for a $1 future sum, at six percent from the financial formula $P=S/(1.06)^{(cell)}$. This shows the present vaule of $1 in the future (n years) assuming a six percent/year time value of money.

From ZX-Appeal, Vancouver SUG, May, 1988

```
   5 PRINT TAB 9;"NICOMACHUS"
  10 LET A$="WHEN DIVIDED BY "
  20 LET B$=" ITS REMAINDER IS?"
  30 PRINT "THINK OF A NUMBER FR
OM 1 TO 100."
  40 PRINT A$;3;B$;
  50 INPUT A
  60 PRINT A
  70 PRINT A$;5;B$;
  80 INPUT B
  90 PRINT B
 100 PRINT A$;7;B$;
 110 INPUT C
 120 PRINT C
 130 PRINT "LET ME THINK A MOMEN
T...."
 140 LET Y=70*A+21*B+15*C
 150 IF Y<106 THEN GOTO 180
 160 LET Y=Y-105
 170 GOTO 150
 180 PRINT "YOUR NUMBER WAS ";Y;
", RIGHT?(Y/N)"
 190 INPUT Q$
 210 IF CODE Q$=62 THEN PRINT "H
OW ABOUT THAT."
 220 IF CODE Q$=51 THEN PRINT "I
 THINK YOU MISCALCULATED."
 230 PRINT "WANT TO TRY ANOTHER?
(Y/N)"
 240 INPUT D$
 245 CLS
 250 IF CODE D$=62 THEN RUN
 260 IF CODE D$=51 THEN PRINT "O
KAY, THANK YOU, GOODBYE."
```

## Meetings

Monthly meetings are held from 11 AM to 4:30 PM, on the second Saturday of each month, at the New Carrollton Public Library.

## Newsletter

Memberships cost $18 per year, are good for 12 months, and include all privileges (access to libraries, group buys, etc.). A newsletter subscription only is available for $12 per year.
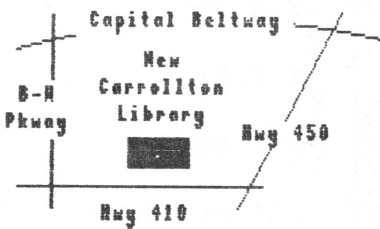
## Networks

Timex SIG on Compuserve: Wednesday night, 10 P.M. Eastern time (GO CLUB).
ASW BBS: (505) 780L-225 FIDO net 15, node 6. East Coast dial (703) 547-4815 FIDO net 18, node 9.

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CATS Newsletter
P.O. Box 467
Fairfax Station, VA 22039

# FIRST CLASS MAIL

The next meeting of CATS will be held on:

Saturday, July 9, 1988    11:00 AM Hardware Workshop
                          2:00 PM General Meeting

At: New Carrollton Public Library
7414 Riverdale Road (Hwy 410), New Carrollton, MD

IF YOU ARE NOT A MEMBER OF CATS, THIS IS THE ONLY ISSUE YOU WILL RECEIVE

DUES: $18 per year, per family